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United States Department of Agriculture (USDA)
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USDA Foreign Agricultural Service

Iran: Crop Progress Report

MY 2010/11

December/ Start of Season Summary **December 28, 2009**

(1) Iran has experienced severe drought and reduced irrigation supplies over the past two winter grain growing seasons (Marketing Years 2008/09 and 2009/10). This has resulted in significant declines in staple foodgrain (wheat) and feedgrain (barley) production, as well as much higher than normal (near-record) grain imports to prevent widespread food insecurity. Drought is estimated to have caused wheat production to fall 34 percent below normal in MY 2008/09 and 21 percent below normal in MY 2009/10. Wheat and barley are the primary grain crops grown in the country and collectively account for 83 percent of Iran's total annual grain production. The fate of the annual winter grain harvest, therefore, directly determines the food security situation in the country. The new MY 2010/11 winter grain planting season has been underway since September, and normally comes to a close in January.

(2) The current outlook for national winter grain production is uncertain at this early stage, and will be dependent on beneficial winter and spring rainfall as well as adequate groundwater irrigation supplies in key producing regions. The majority (62 percent) of the nation's irrigation supplies for agriculture are derived from pumping groundwater sources, with the remaining 38 percent emanating from surface water flow (snowmelt and rainfall runoff) through rivers. Approximately 2.6 million hectares or 38 percent of the country's wheat acreage is irrigated. Given the severity of drought during the past two years in Iran, it is assumed that groundwater tables have significantly declined in many core producing regions. This pattern seems to be confirmed in remote sensing analysis conducted during the past two growing seasons which indicates irrigated winter grain area has been well-below normal. It is doubtful that irrigated winter grain area can recover to near-normal levels this year, given the rainy season has just begun and replenishment of groundwater supplies will take time (possibly several years).

(3) The planting window for winter grain crops in Iran is quite wide, extending from September through January in many areas. While actual planting dates vary from region to region depending on climatic variations and available resources, the bulk of Iran's winter grains (wheat and barley) are sown during the months of October and November (Figure 1). Crops sown in early autumn have enough time to germinate and emerge from the ground before persistent freezing temperatures cause them to become dormant. Sparse winter grain vegetation can usually be detected in western and north-central provinces in the November-January period by satellites (vegetation index data), however the majority of crop growth and development occurs from February-May as daytime temperatures rise and peak seasonal rainfall occurs. Approximately 73 percent of annual rainfall occurs in the winter and spring

months. In the warmer climates along the Persian Gulf and Caspian Sea, winter grain crops develop up to a month earlier than other areas of Iran, providing the earliest evidence of crop progress and regional grain production potential (Figure 2). Maximum vegetation development for winter grains usually occurs from April to May in Iran, while crops are normally harvested from May to July (Figures 3-5). As of the publication of this report it is assumed that the MY 20010/11 planting season has come to an end in all but a few provinces in Iran and that the bulk of winter grain crops are entering dormancy phases.

(4) The rainfall pattern in Iran tends to largely conform to the geographic extent of the country's major mountain ranges; the Zargos range running from the northwest corner (Turkey and Azerbaijan borders) following southeast along the western boarder of the country, and the Alborz range running from northwest to northeast along the Caspian Sea. The highest annual precipitation rates occur in Gilan province along the Caspian Sea and throughout the higher elevations of most of the northwestern provinces. These regions have large concentrations of non-irrigated winter grain crops and typically account for over 50% of national grain production. On a monthly basis, the rainiest times of the year correspond directly with the winter grains growing season from October to May (Figure 6).

Winter Grains – Background

(5) The MY 2008/09 (calendar year 2007-2008) winter grain production season was affected by a serious nationwide drought, with many of the major grains production areas of Iran receiving less than half of normal rainfall (Figure 7). The lack of precipitation resulted in dramatic crop loss, most evident in the northwest provinces where crops are primarily non-irrigated (Figure 3). Both wheat and barley production declined by one-third from the previous year. During last year's growing season (MY 2009/10) the major rainfed grain provinces of the northwest and northeast received normal rainfall levels, but severe dryness continued to predominate in important, irrigated grain producing provinces such as Fars and Khuzestan (southwest). As a result, rainfed grain production returned to near-normal levels while irrigated production declined. Total wheat production reached approximately 80 percent of normal levels.

(6) Irrigation provides the foundation for sustainable winter grain cropping in Iran, and is the primary element on which future growth in production and food security is based. Increasing foodgrain acreage under irrigation through expansion of the nation's irrigation infrastructure (dam, reservoir, canal, and wells) is a major ongoing priority of the government. On a national basis, 70 percent of wheat production and 65 percent of barley production is normally harvested from agricultural fields that are at least partially irrigated. Iran's central and eastern provinces normally receive the lowest annual rainfall in the country and grow the majority of irrigated winter grains. By comparison, the majority of land devoted to grains in the high rainfall regions of northwest and north central Iran (along the Caspian Sea) are primarily non-irrigated rainfed grain crops (Figure 8). The agricultural landscape in Iran is primarily focused in mountain valley systems and in the lowlands surrounding major rivers. Irrigation supplies emanate from both surface runoff in rivers and streams and from harvesting groundwater aquifers. The vast majority of irrigation used for winter grains comes

from groundwater, being pumped from wells, springs, and subterranean qanats (a traditional system of moving ground water from one place to another through underground canals).

(7) During the MY 2008/09 drought, much of Iran's irrigated crop acreage was able to remain productive owing to ample reservoir and groundwater supplies. However, as drought conditions continued into the MY 2009/10 season, the drawdown of reservoirs and declining groundwater tables resulted in a dramatic reduction of irrigated agricultural land (Figure 10 and 11). The provinces of Fars and Khozestan, which collectively produce over 24% of national wheat and 10% of barley production on primarily irrigated land, are most susceptible to a continued lack of rainfall in the coming growing season. Having experienced two years of well below normal rainfall, irrigation supplies are rapidly diminishing. Without improved rainfall conditions as well as ample winter snow pack to replenish ground and surface water supplies, irrigated crop production potential in these key provinces will likely decline again this season.

(8) Figure 12 highlights USDA's national wheat and barley production estimates for Iran over the past 10 years. Wheat production has ranged between 12 and 15 million metric tons annually, with the exception of drought years: MY 2000/01, MY 2001/02 and MY 2008/09. Barley production has averaged approximately 3 million metric tons annually, also with the exception of drought years. On the other hand, national requirements for domestic consumption have totaled an estimated 15-16 million tons of wheat per year and 3-4 million tons of barley over this period.

Winter Grains –Current Season

(9) The MY 2010/11 grain planting season in Iran started out very dry, with minimal rainfall during September and October. However, an extremely beneficial change in the weather pattern occurred during November and December which brought well-above normal precipitation to most of the nation's important growing regions. This rainfall ensured farmers had adequate moisture to plant their grain crops, achieve timely seed germination, and get them growing before critically low temperatures slowed their growth rates (Figures 12 and 14). Non-irrigated croplands in the major northwestern provinces, which collectively account for about 53% of national wheat and 47% of barley production, received particularly high rainfall in November. This moisture will ensure healthy early growth and provide excellent stored soil moisture for later in the spring, when rainfed crops are particularly vulnerable to drought conditions. Recent rainfall was also very beneficial in primarily irrigated grain provinces such as Khozestan, which has experienced sustained drought and depleted water reserves over the past two years. Irrigated croplands in Fars and Bushehr provinces have also been receiving better than normal rainfall. Warm temperatures, ample rainfall, and improving soil moisture supplies provided near-ideal planting conditions in Iran (Figure 15).

(10) Satellite-derived vegetation index (NDVI) analysis, comparing the current season against last year and the 6-year average (Figure 16) indicates that overall vegetative development is slightly behind normal in the north east Khorasan region as well as the grains areas of Fars province in the southwest. Vegetation in the northwest is showing slightly better than average

conditions in the northwest provinces, which are primarily rainfed. The provinces of Khozestan, Ilam and Lorestan, collectively responsible for nearly 15% of total winter grains production are showing much improved NDVI conditions over this time last year (Figures 18 and 19). The late onset of the rainy season this year is expected to cause a slight delay in the average date of crop emergence. However, given this early stage of the growing season, there is currently no concern. Continued monitoring of crop development will occur from January through June, with comparative analysis reported on an ongoing monthly basis.

(11) Monitoring of winter snow pack conditions is important to crop assessments in Iran because snow cover has two important roles in winter grains production. First, and most importantly, snow accumulation over agricultural fields as well in Iran's higher mountain ranges provide an important source of ground water for crop growth and aquifer recharge during spring snow melt. Secondly snow cover over grain fields helps cover and protect emerged grain seedlings from extreme low temperatures during the coldest months of the winter dormancy period. Snow cover and snow depth in Iran as of early December 2009 is slightly below normal, with snow primarily focused at the highest elevations. Warmer than normal temperatures over the past two months may account for the slightly below normal snowpack, as precipitation in the warmer, lower elevation areas took the form of rainfall. The winter snowpack generally reaches its peak between mid-January and early February (Figure 20).

(12) NOAA's Climate Prediction Center is forecasting additional light rainfall over the period December 23 through December 30, 2009, with highest precipitation coming off the Caspian Sea and falling over the Northern provinces, particularly along the Alborz mountains (Figure 21).

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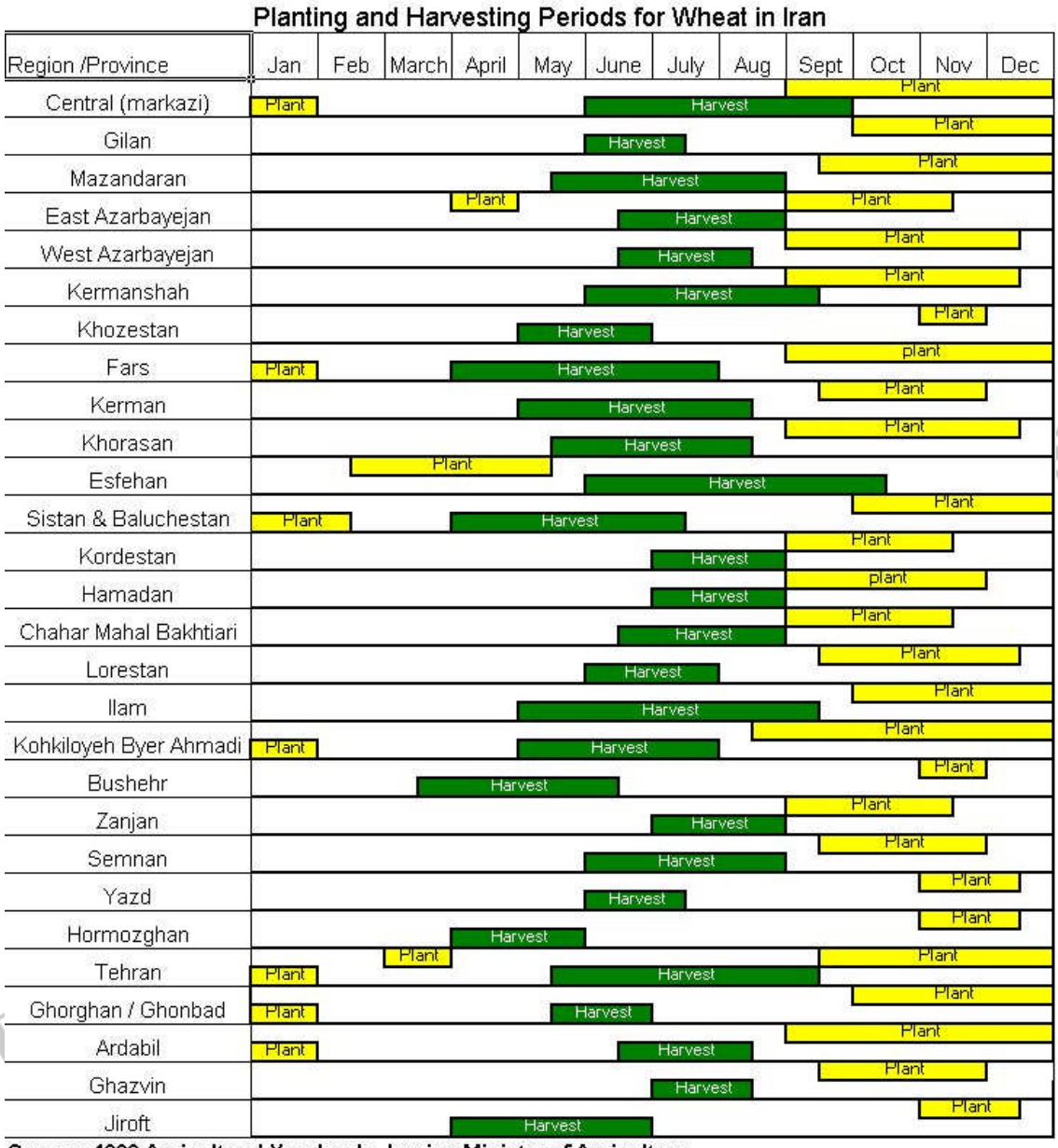

Figure 1. Provincial crop calendar for winter wheat (and barley) in Iran. October, November and December are prime planting months, though specific timing and length of planting season varies according to local climatic conditions.

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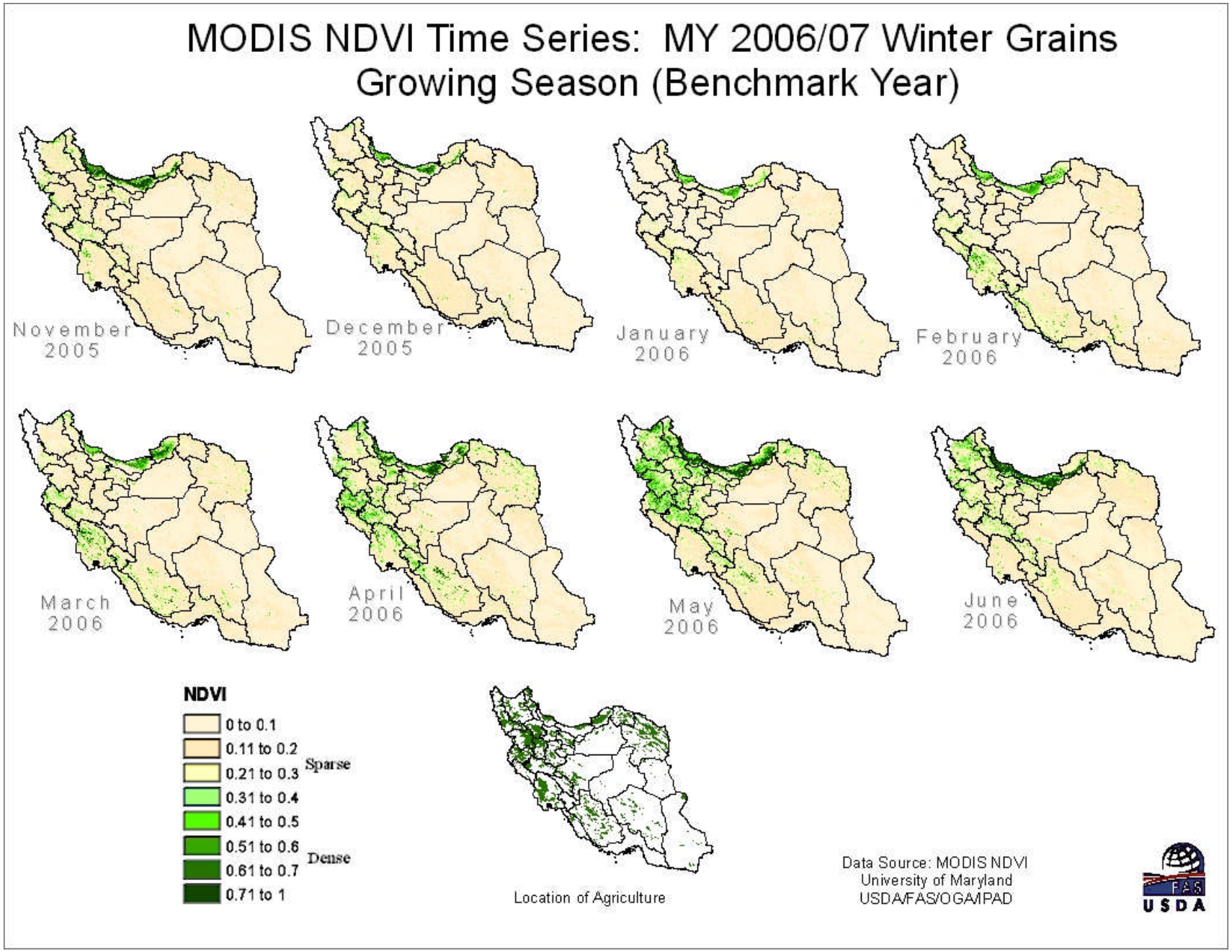

Figure 2. Vegetation growth through the winter grains growing season. First evidence of crop green-up apparent in February around the Persian Gulf provinces.

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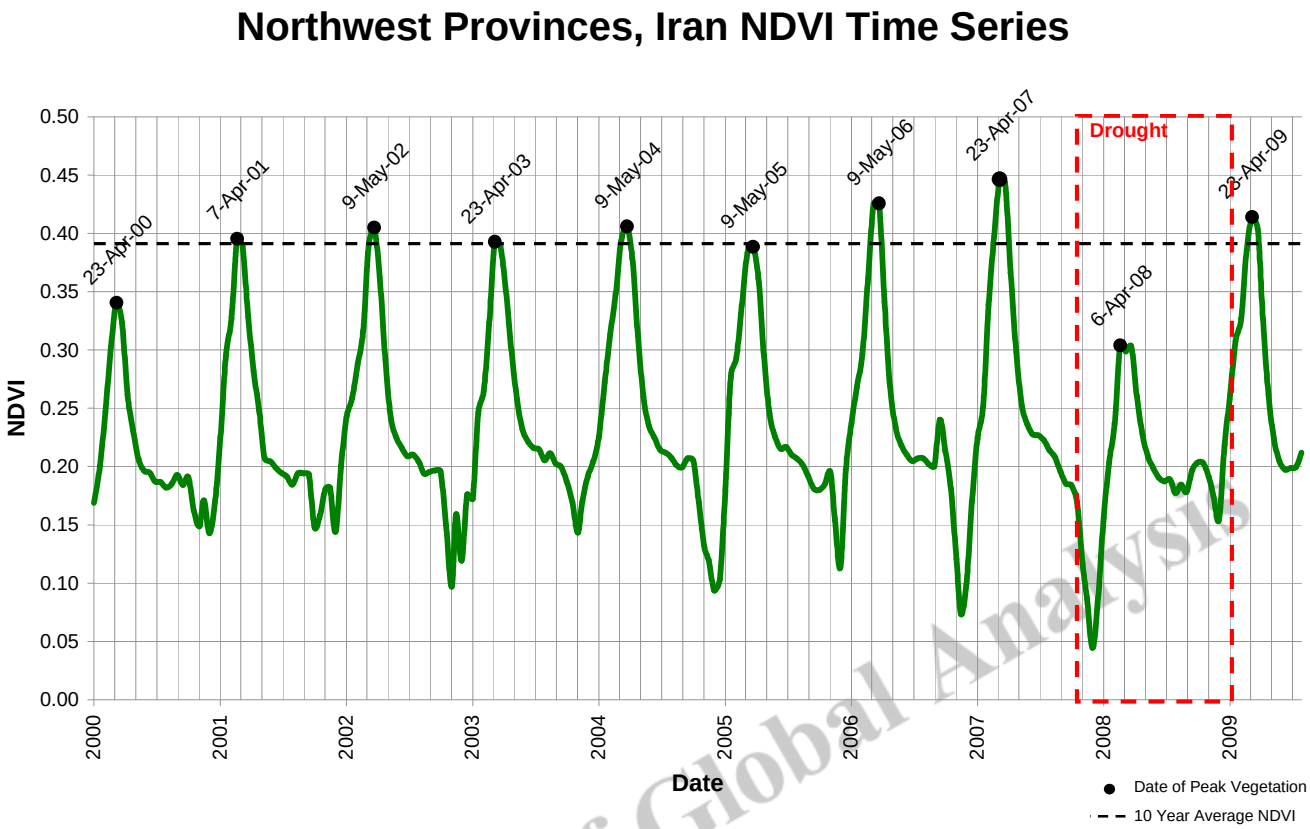

Figure 3. NDVI graphs displaying vegetation trends in winter grains regions of northwest Iran. MY 2008/09 drought highlighted.

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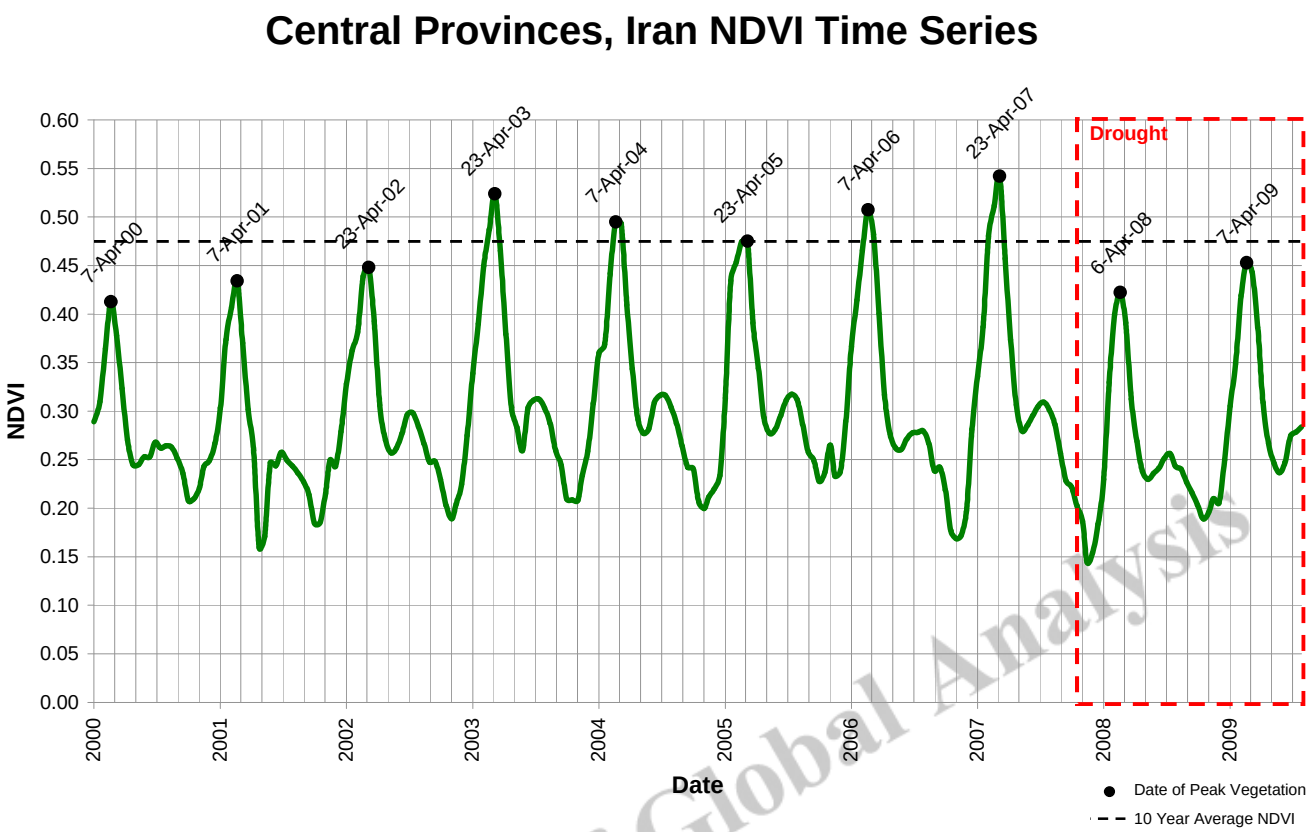

Figure 4. NDVI graphs displaying vegetation trends in winter grains regions of central Iran. MYs 2008/09 and 2009/10 drought highlighted.

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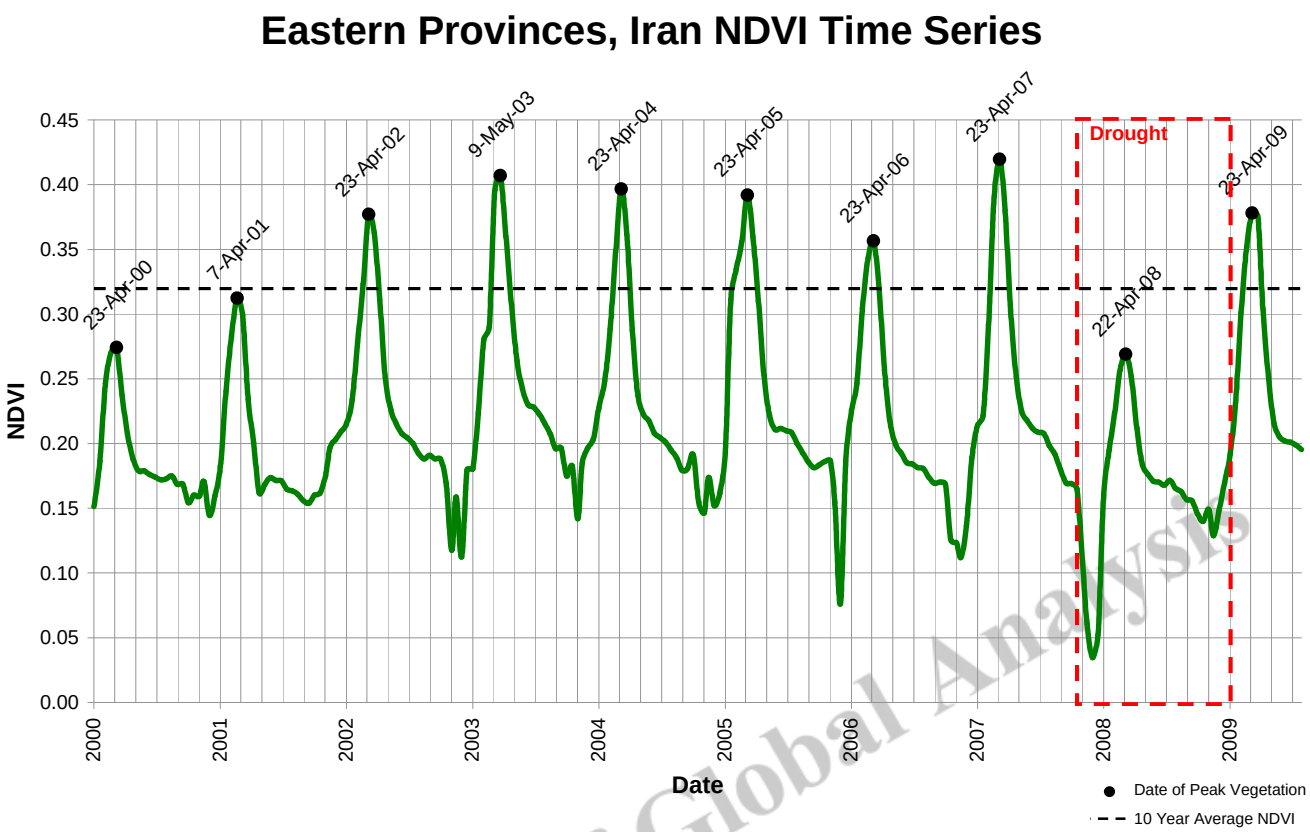

Figure 5. NDVI graphs displaying vegetation trends in winter grains regions of eastern Iran. MY 2008/09 drought highlighted.

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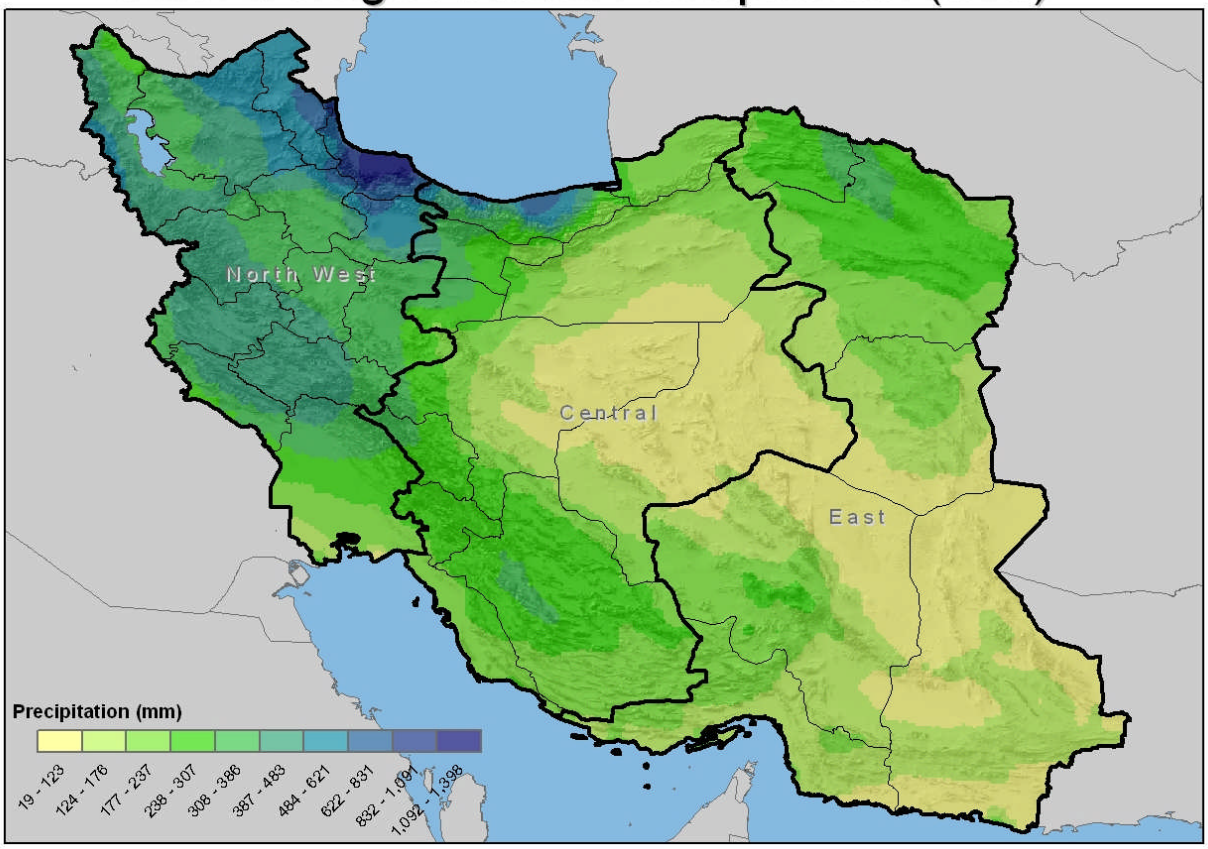
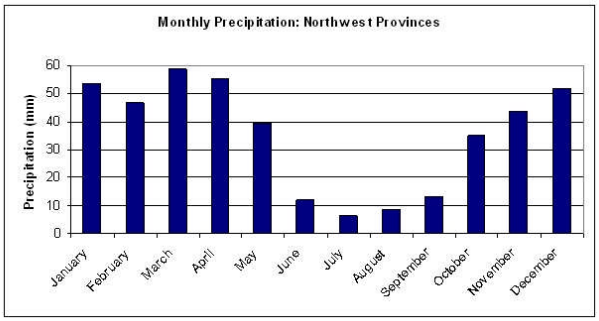
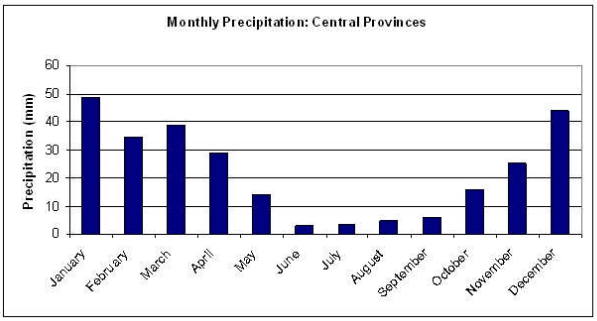
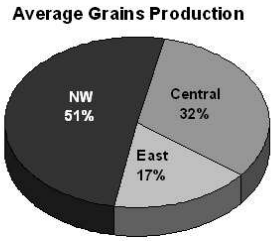
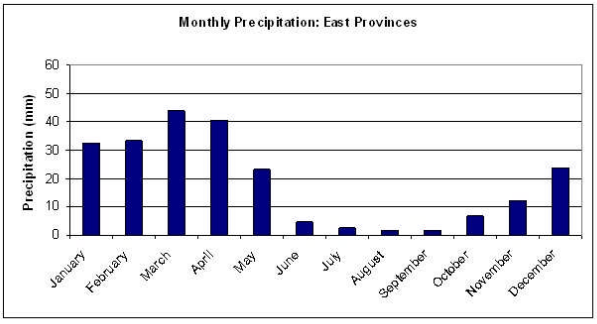
Iran Average Annual Precipitation (mm)











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Data Source: AFWA Precipitation
USDA-FAS,
Office of Global Analysis- IPAD
Crop Explorer

Figure 6. Average cumulative precipitation annually and regional average precipitation graphs by month

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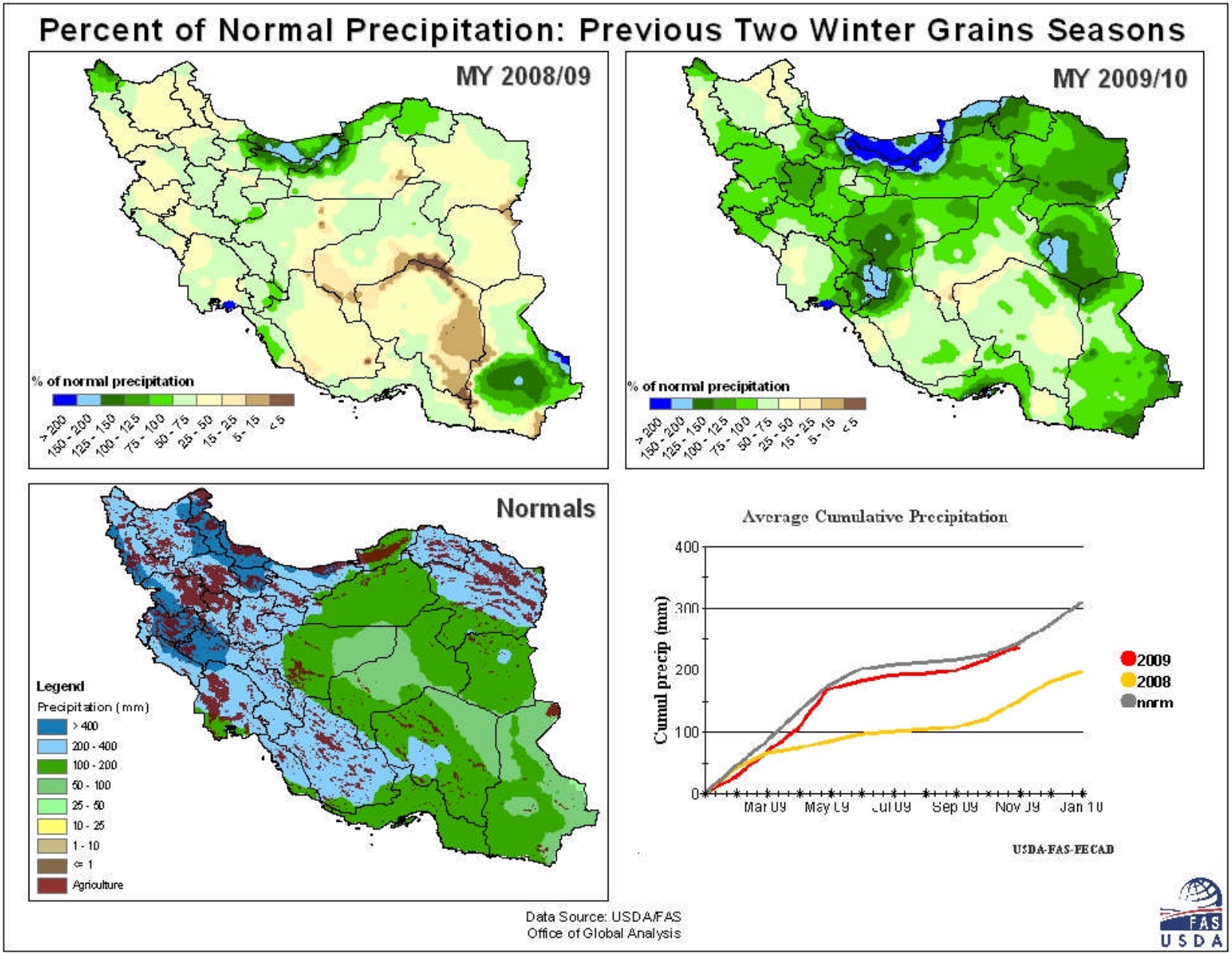

Figure 7. Percent of normal precipitation during grains seasons of MYs 2008/09 and 2009/10. Severe national drought affected grains production in MY 2008/09; MY 2009/10 saw precipitation recovery in some provinces of NW and NE Iran but an extended second year drought in major wheat provinces like Fars and Khuzestan.

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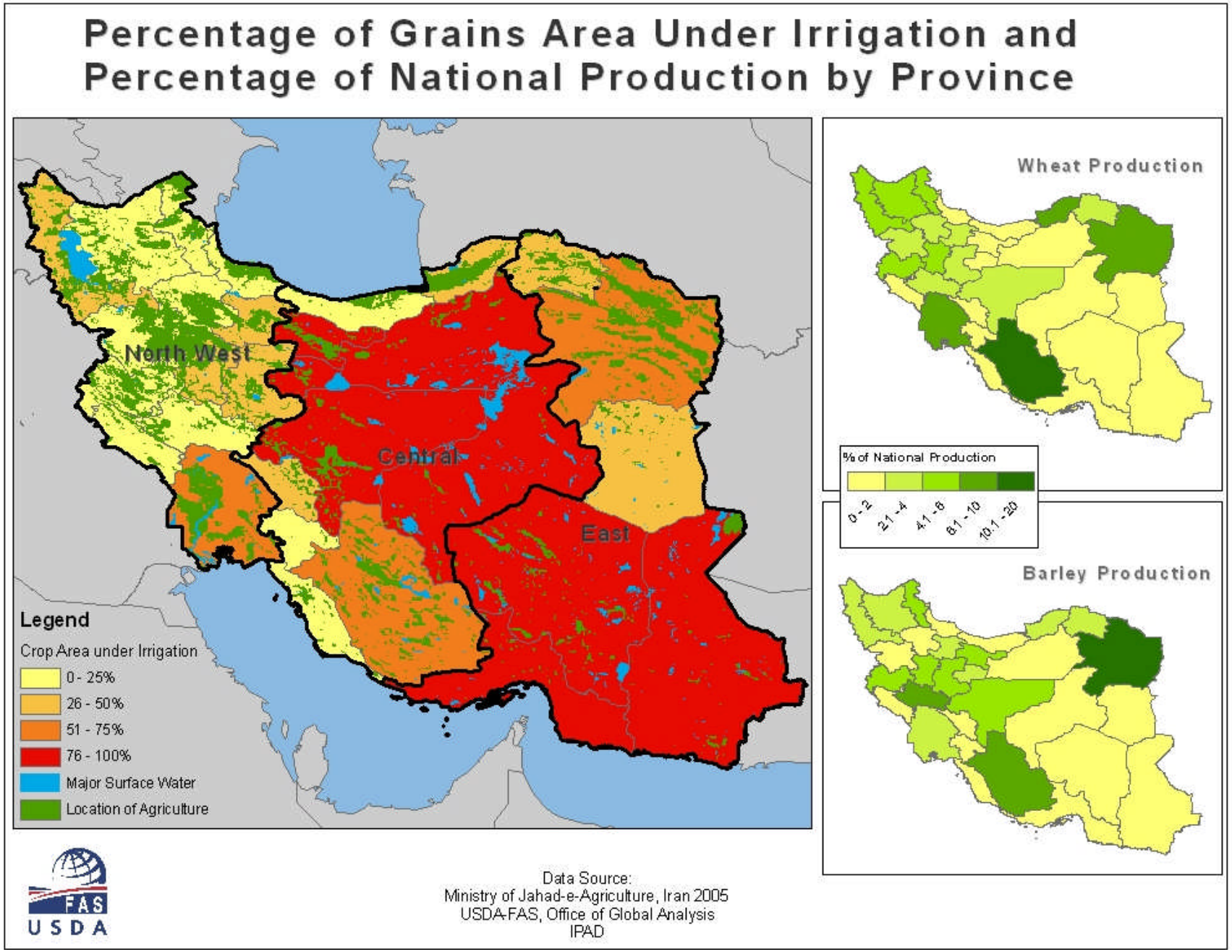

Figure 8. Percentage of total grains area by province cultivated, at least partially, through irrigation and percentage of national wheat and barley production by province.

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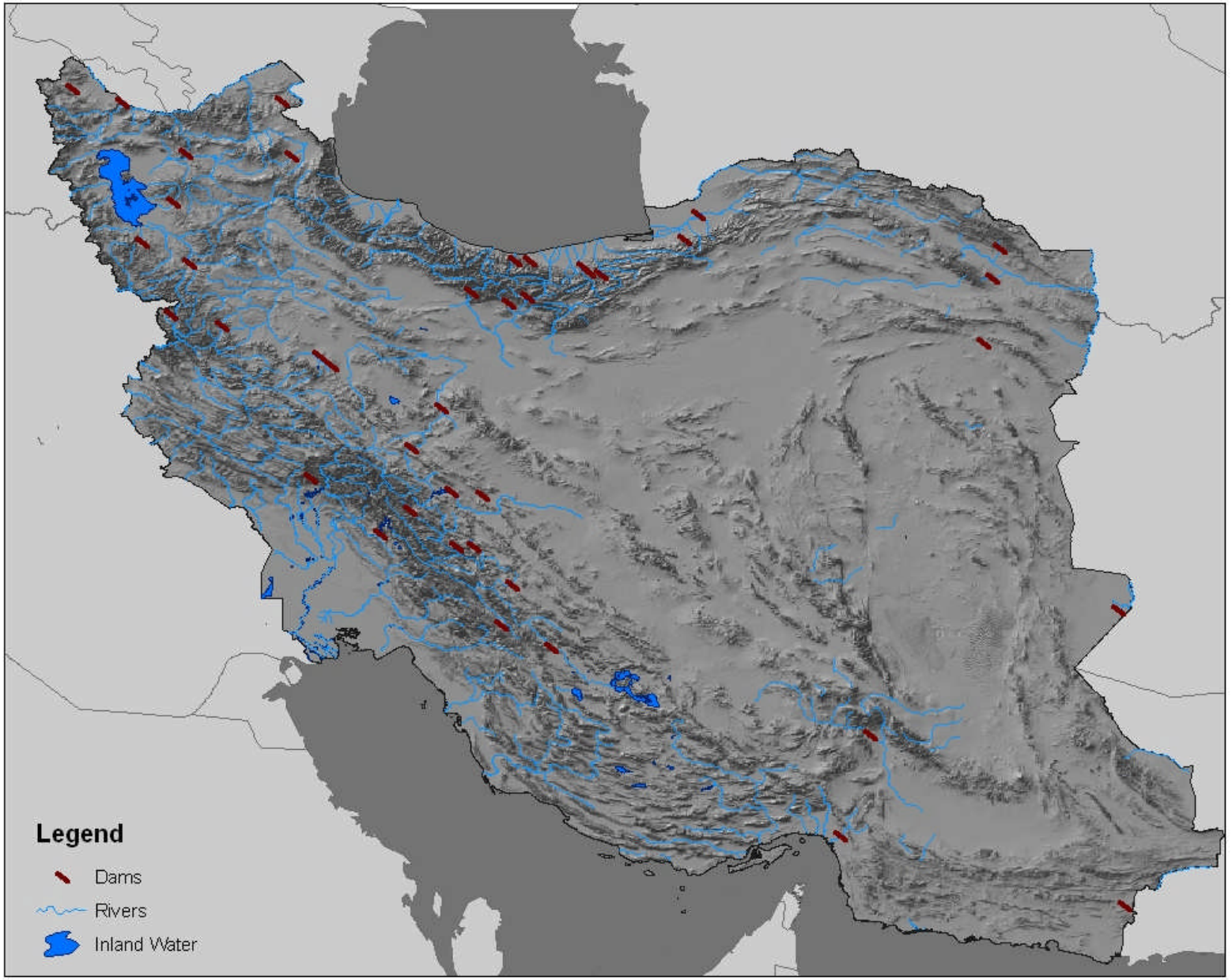

Figure 9. Location of inland water in Iran.

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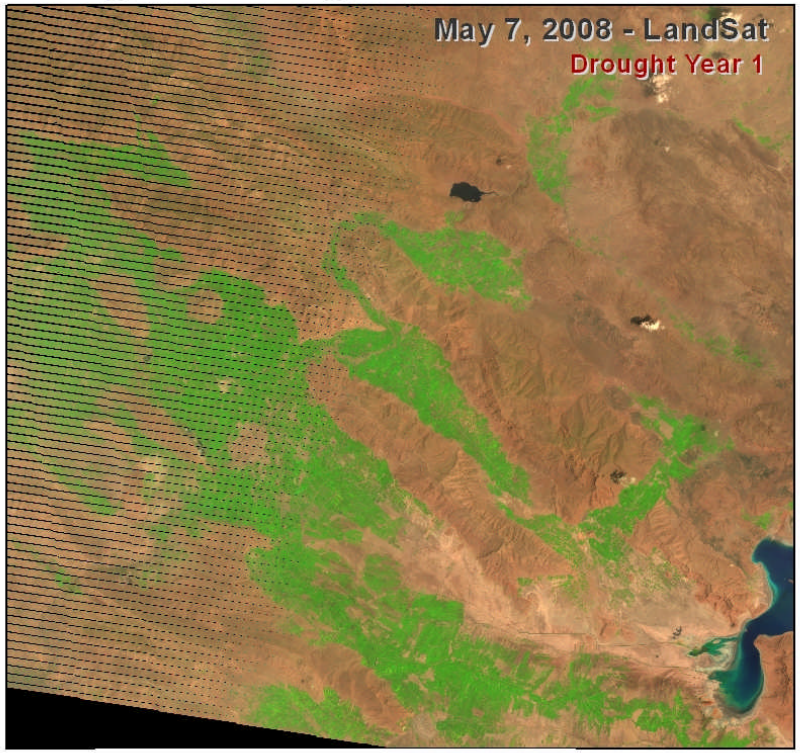
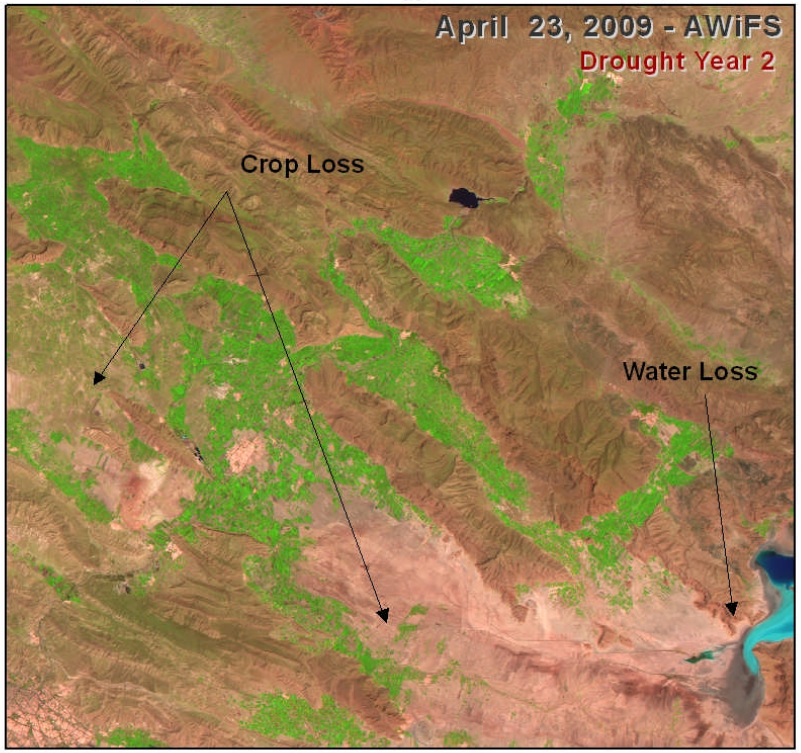
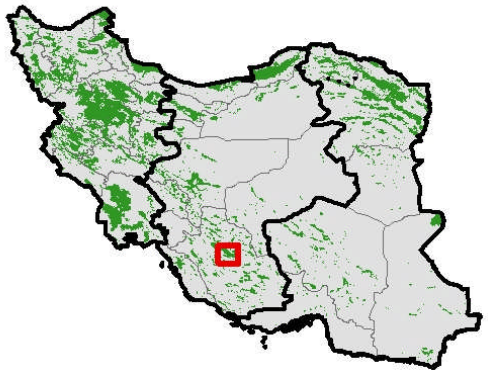
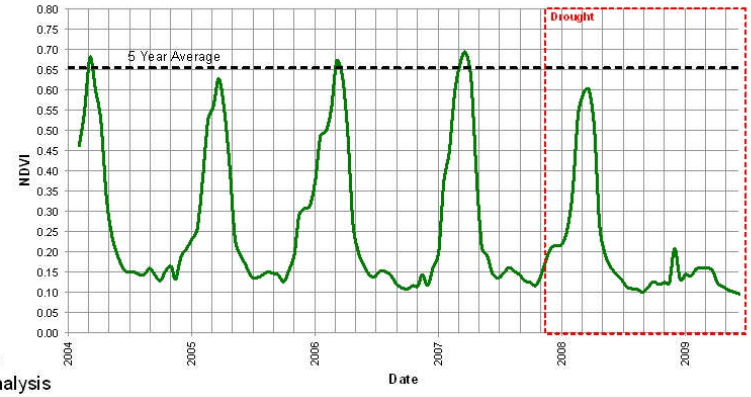
Irrigated Agriculture Vulnerability to Drought: Fars, Iran







Irrigated Agriculture NDVI Time Series: Fars, Iran



Data Source:
AWiFS IRS P-6, Provided by NGA
Landsat ETM+, Provided by USGS
Supporting USDA/FAS/Office of Global Analysis

Figure 10. Example of major crop loss due to drying irrigation sources after second year of continued drought. NDVI graph indicates that irrigation sources may stabilize agricultural production in the early stages of drought while water supplies remain available but only to a limit.

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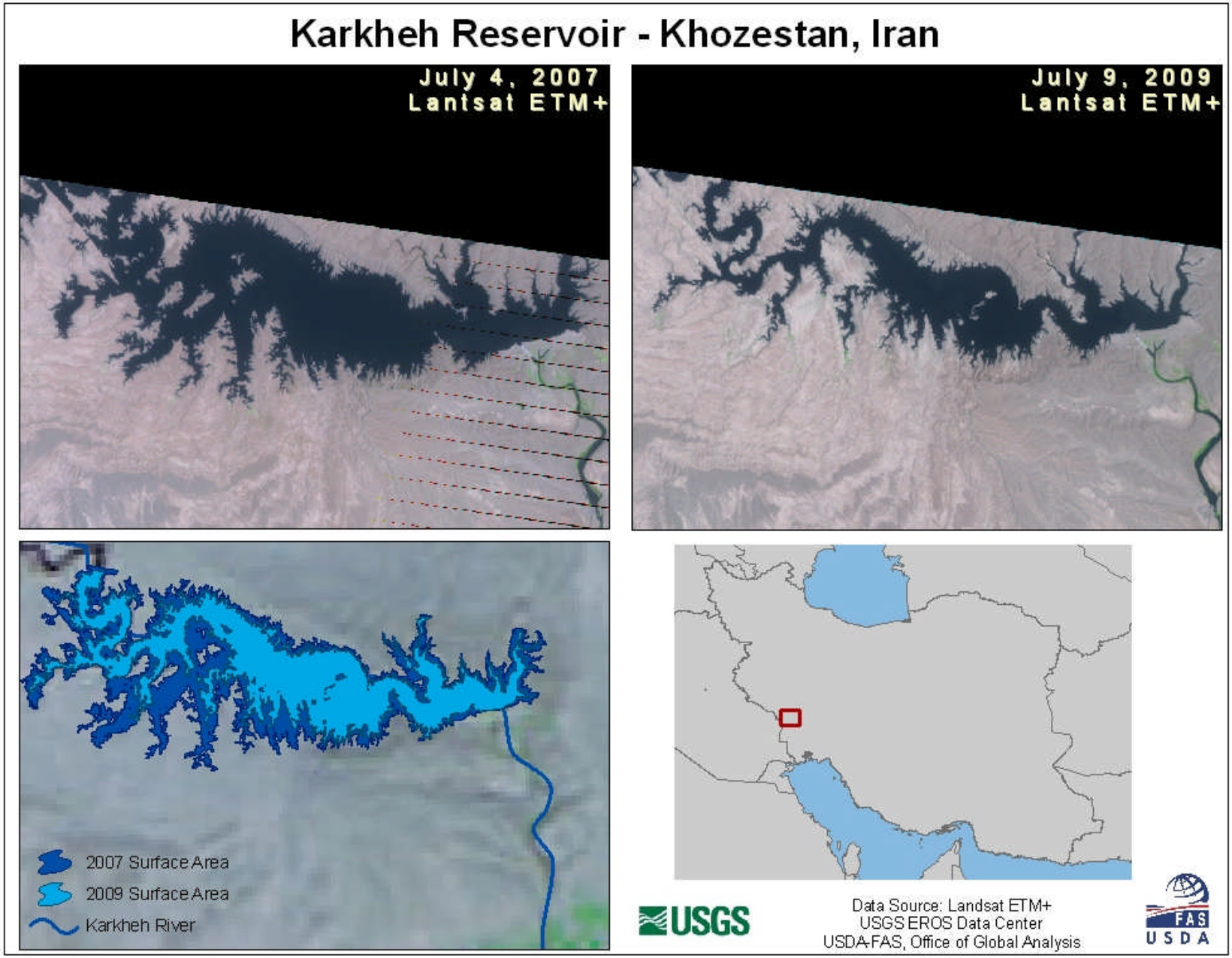

Figure 11. Dramatic water loss in the Karkheh Reservoir located in Khozestan province, western Iran. After two years of sustained drought and continued water use of the Karkheh River for summer and winter crop irrigation the reservoir surface area has dropped over 43%.

Commodity	Attribute	Country	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010
Wheat	Area (1000 HA)	Iran	5,101	5,553	6,241	6,409	6,605	6,951	6,500	6,900	5,850	6,000
	Yield (MT/HA)	Iran	1.59	1.70	1.99	2.10	2.21	2.06	2.23	2.17	1.71	2.00
	Production (1000 MT)	Iran	8.088	9.459	12.45	13.44	14.568	14.308	14.5	15	10	12
Barley	Area (1000 HA)	Iran	1,194	1,487	1,670	1,510	1,600	1,659	1,700	1,700	1,300	1,400
	Yield (MT/HA)	Iran	1	2	2	2	2	2	2	2	2	2
	Production (1000 MT)	Iran	1.686	2.423	3.085	2.908	2.94	2.857	3	3	2	2.6

Table 1. Area, Yield and Production statistics for small grains in Iran, previous ten years. Drought years include MY's 2000/01, 2001/02 and 2008/09.

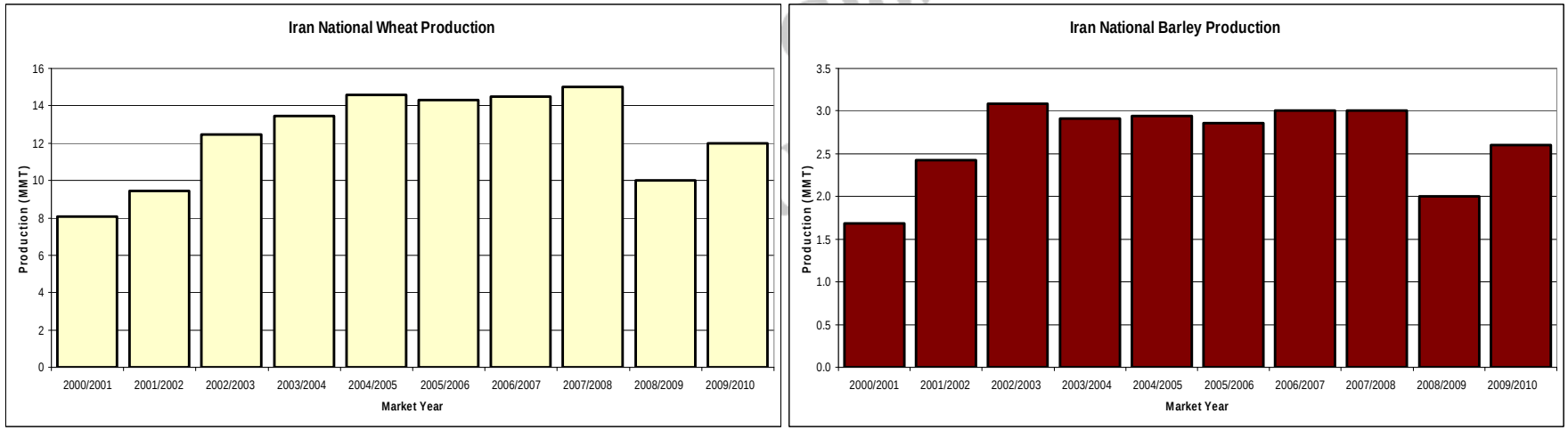

Figure 12. Production and Yield statistics for small grains in Iran, previous ten years.

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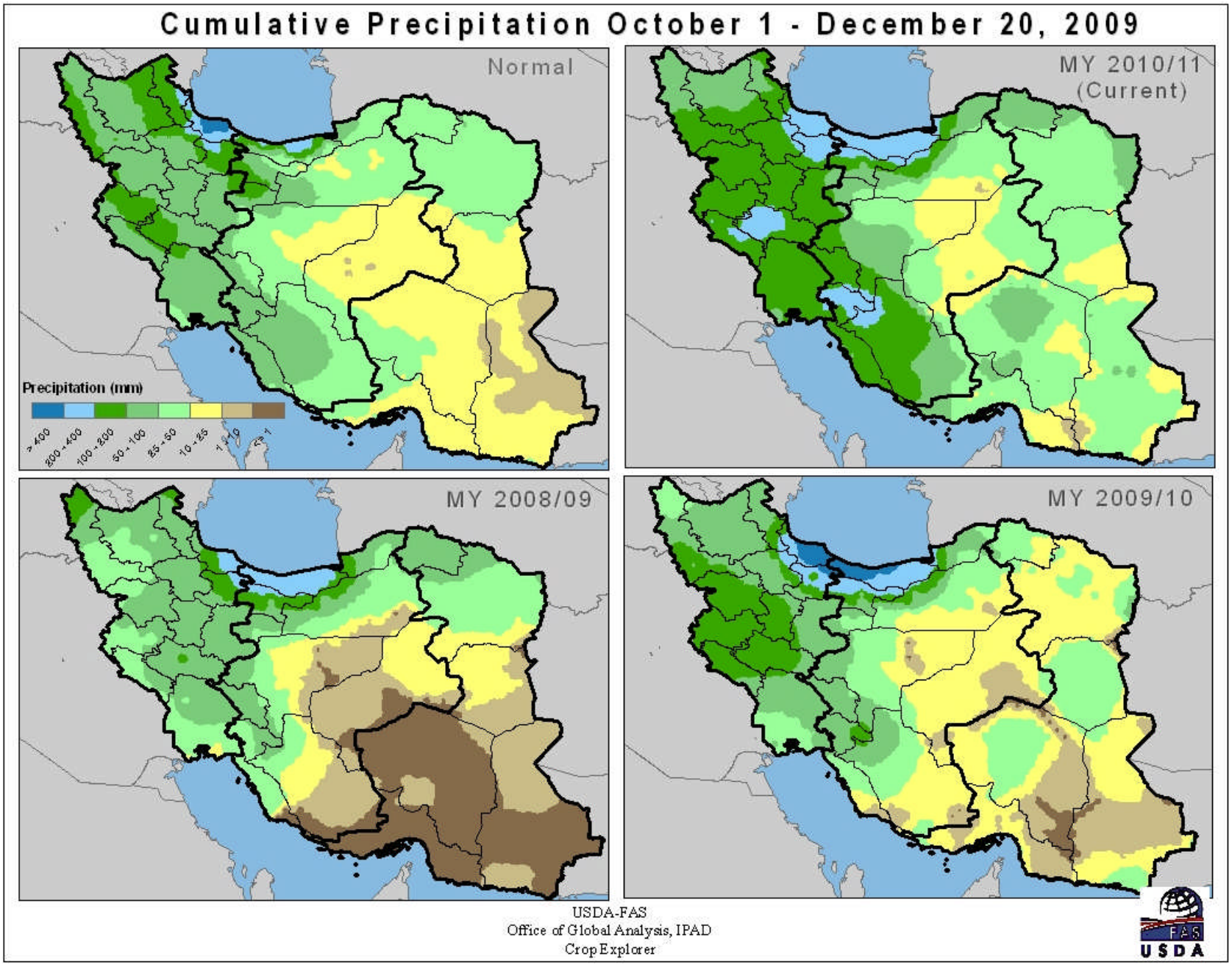

Figure 13. Iran season-to-date precipitation since October 1, 2009 – Current conditions (MY 2010/11), compared against previous two grain seasons.

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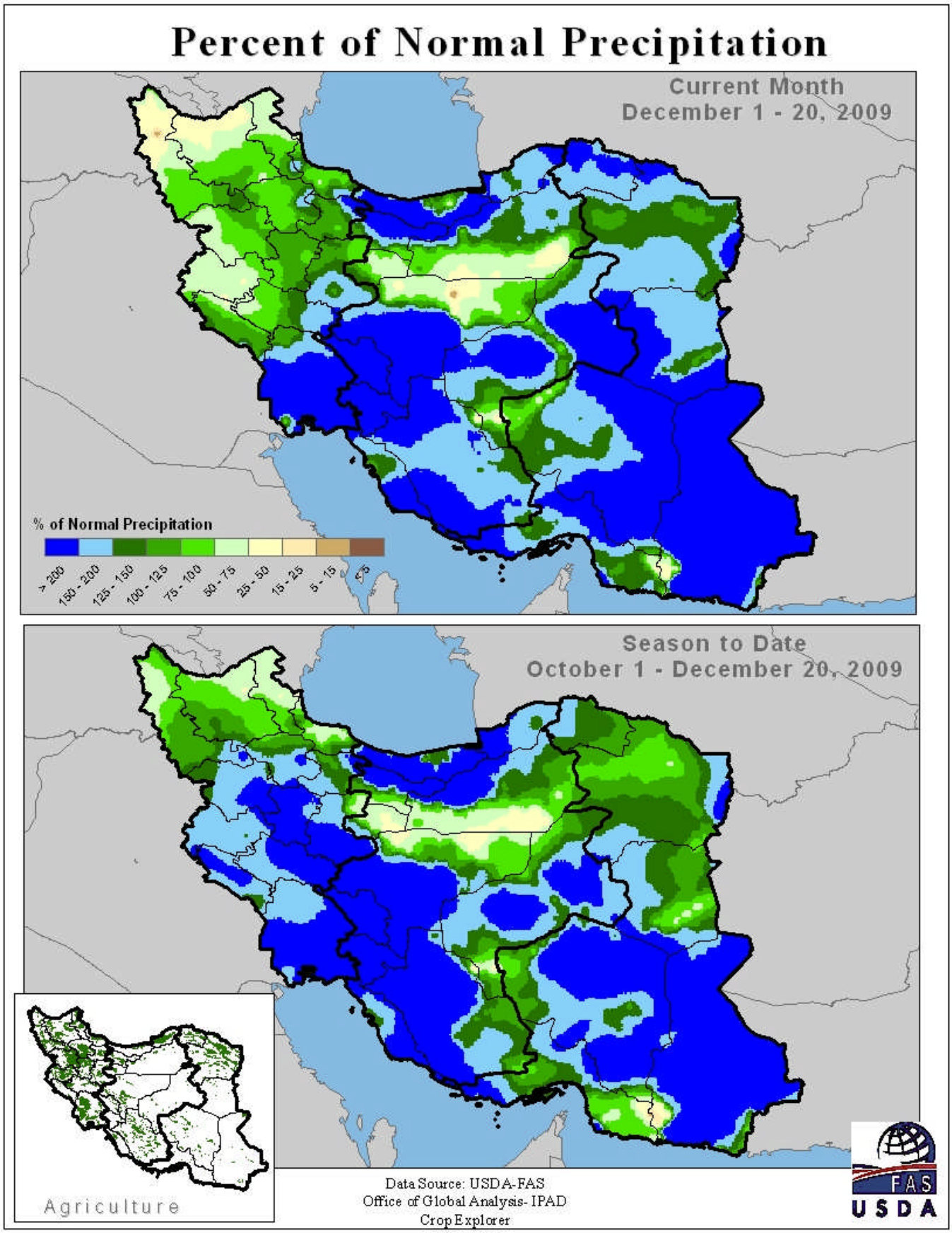

Figure 14. Percent of normal precipitation, season to date and first two decades of November.

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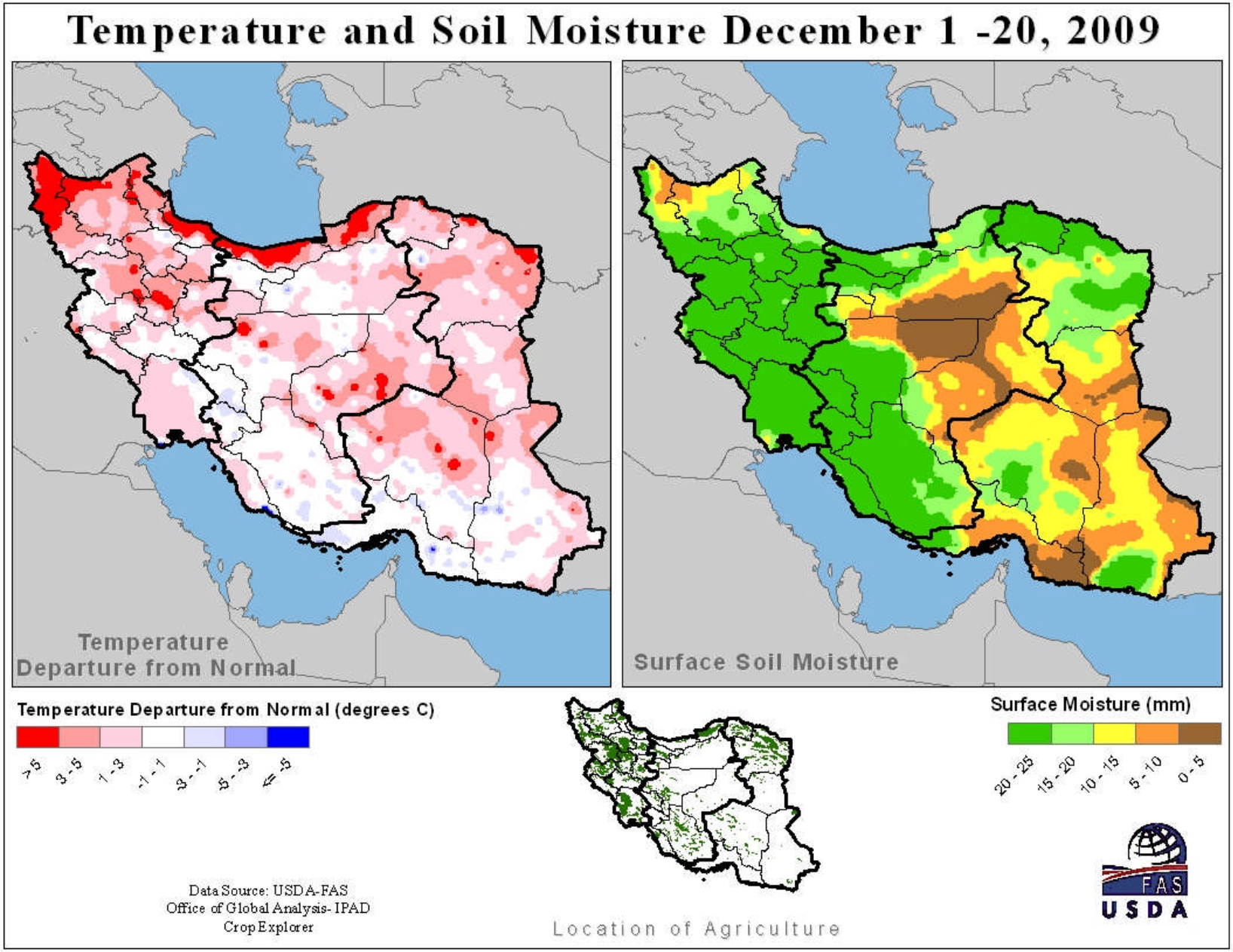

Figure 15. Iran temperature departures from normal for the first two decades of December, 2009 (MY 2010/11) and surface soil moisture, a function of evapotranspiration and precipitation. 10-mm or less surface moisture will not support seed germination or early growth potentials for a recently emerged crop.

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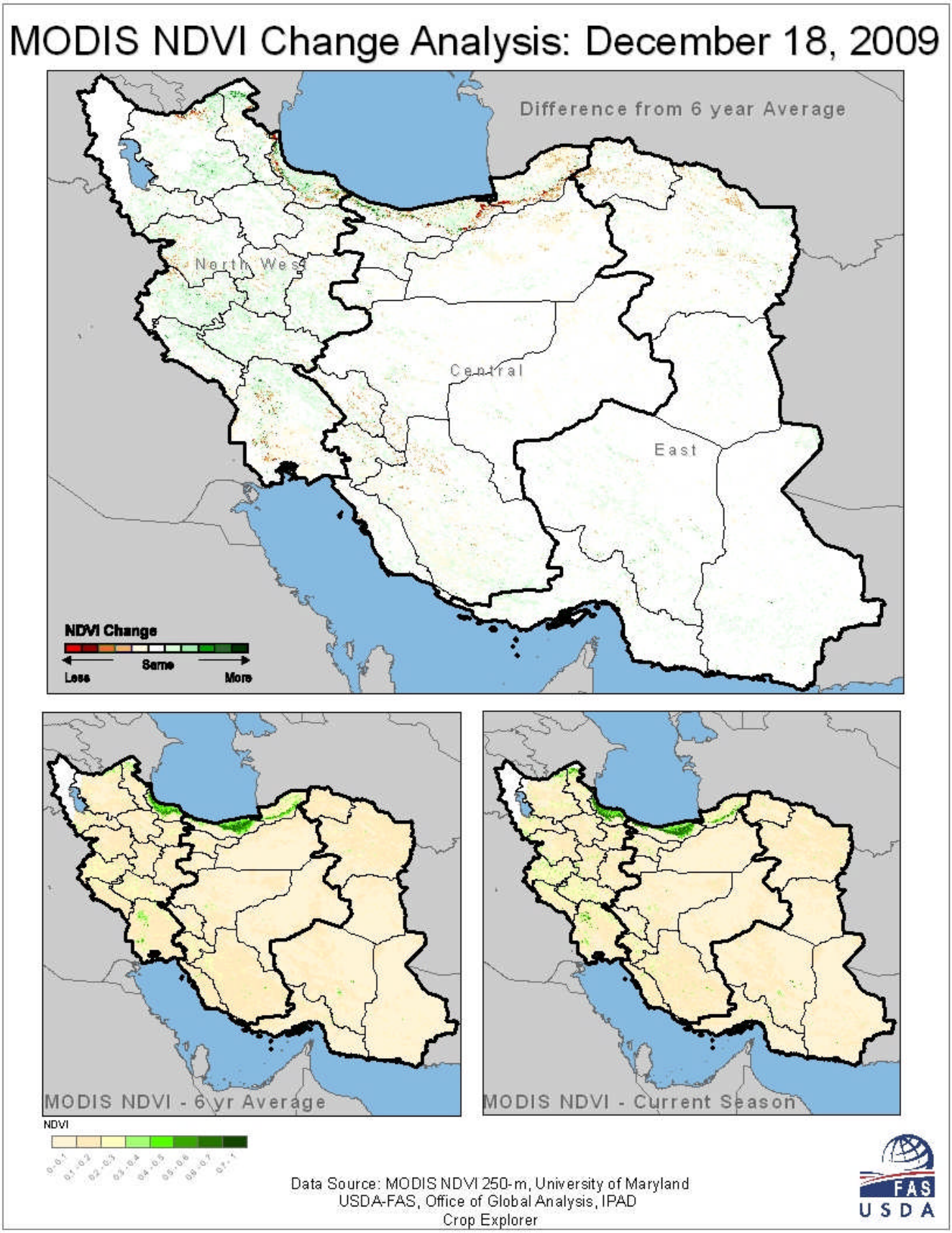

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Figure 16. NDVI comparison, current status of agricultural field green vegetation (MY 2010/11) compared against previous 6-years average.

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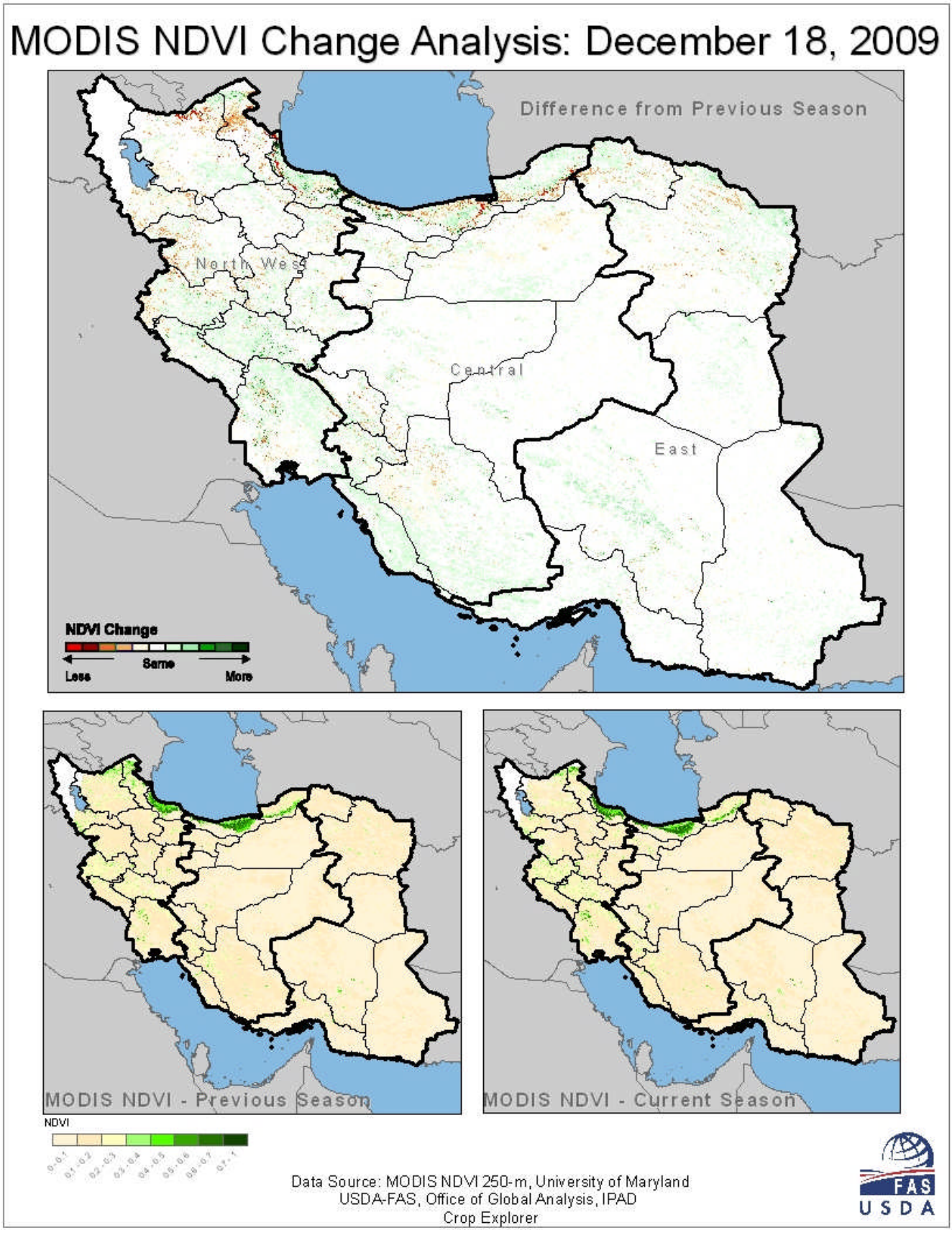

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Figure 17. NDVI comparison, current status of agricultural field green vegetation (MY 2010/11) compared against previous year (MY 2009/10).

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MODIS NDVI Change: MY 2010/11 vs. MY 2009/10

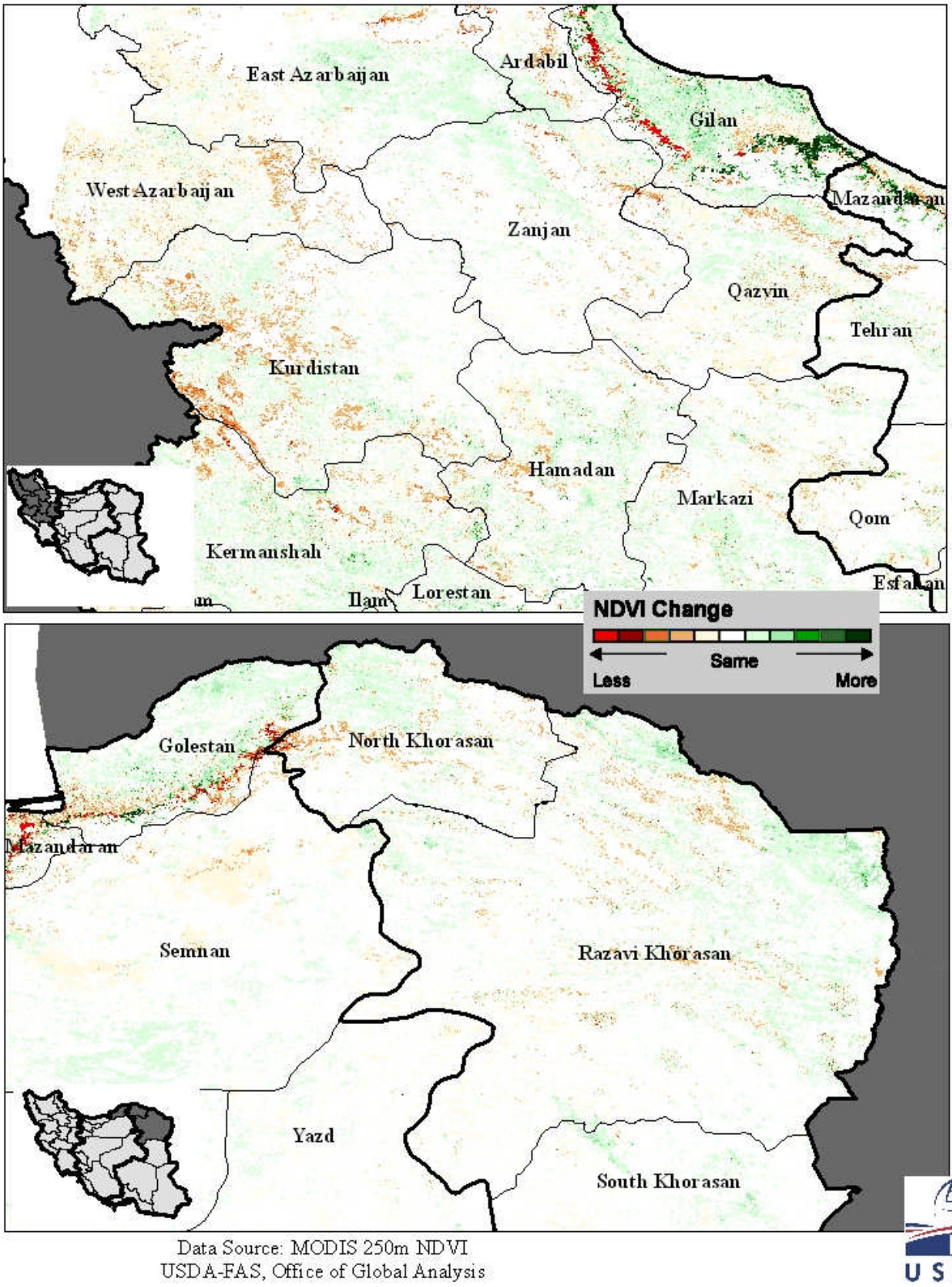

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Figure 18. NDVI comparison, current status of agricultural field green vegetation (MY 2010/11) compared against previous year (MY 2009/10) showing major grains provinces in the NW and NE.

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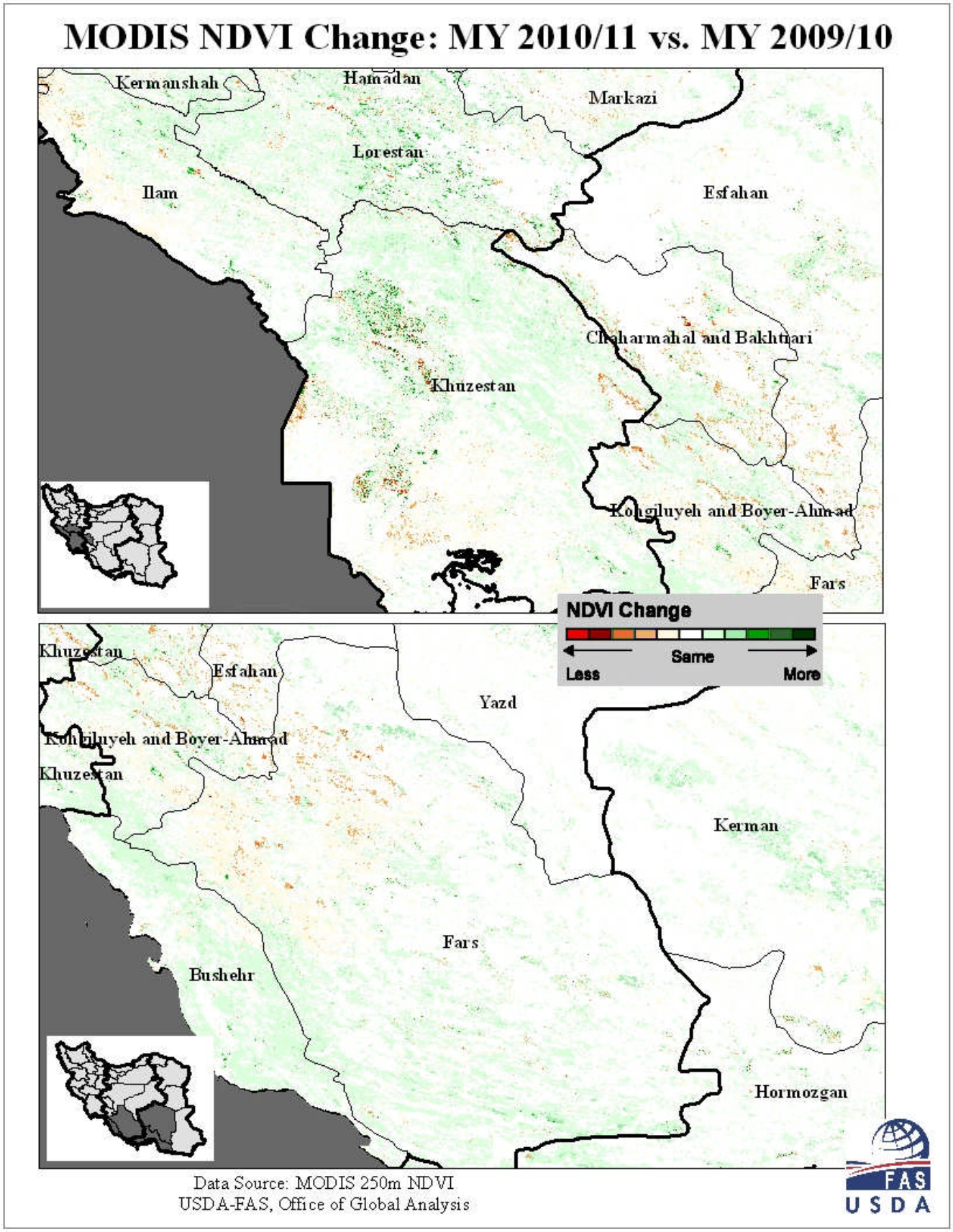

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Figure 19. NDVI comparison, current status of agricultural field green vegetation (MY 2010/11) compared against previous year (MY 2009/10) showing major grains provinces in the southwest.

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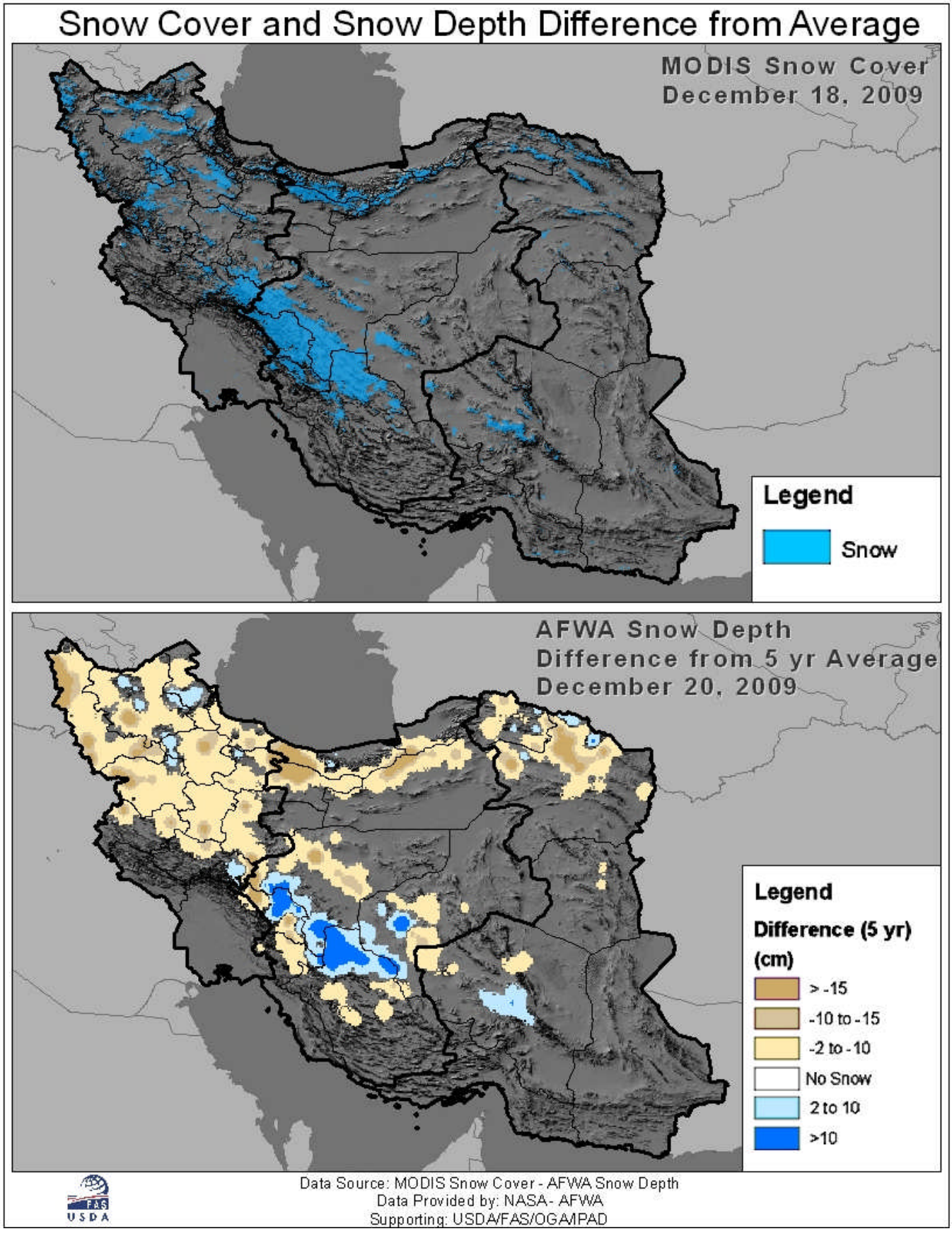

Figure 20. Location of current snow cover and snow depth difference from average.

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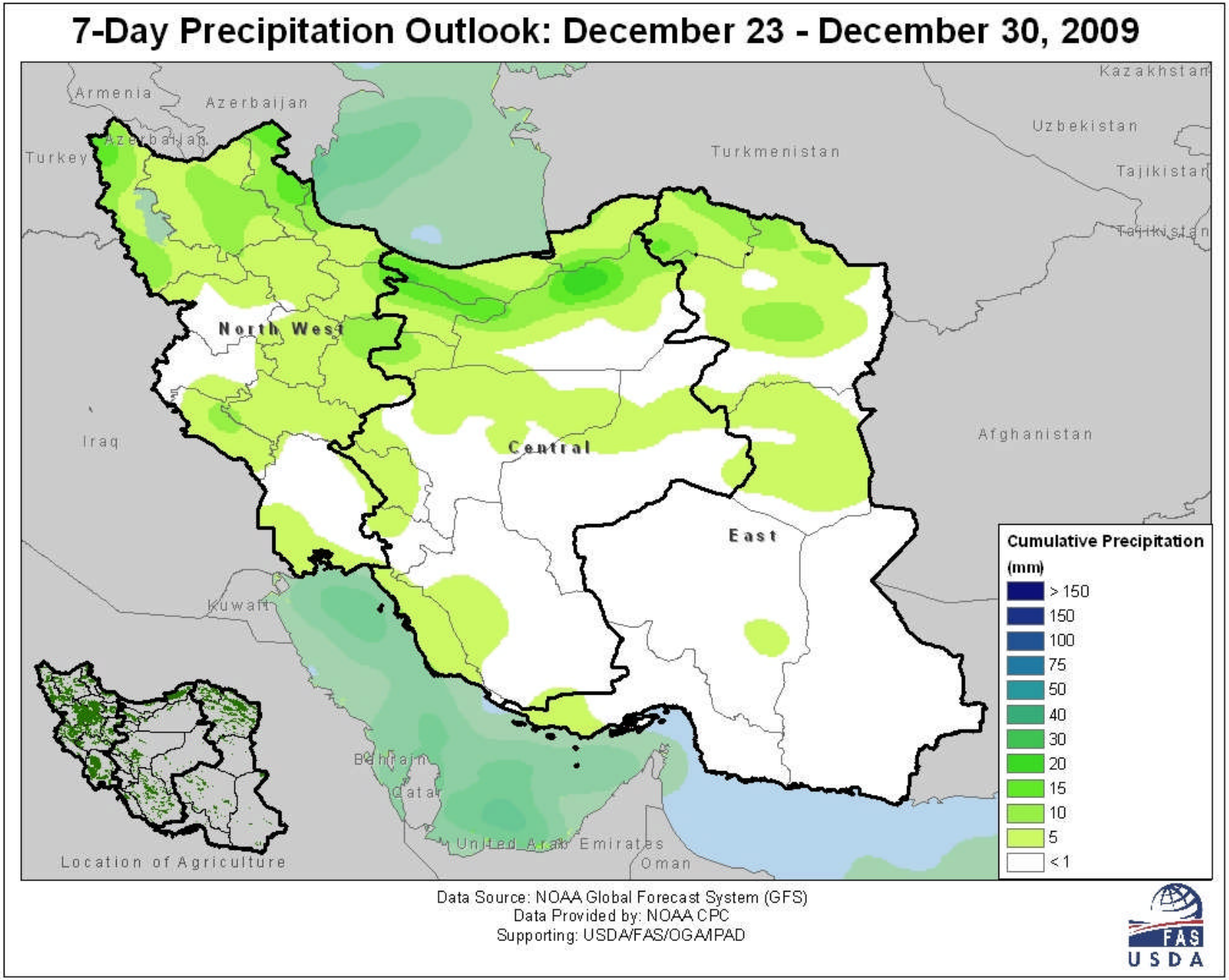

Figure 21. NOAA Climate Prediction Centre 7-day precipitation forecast for Iran.

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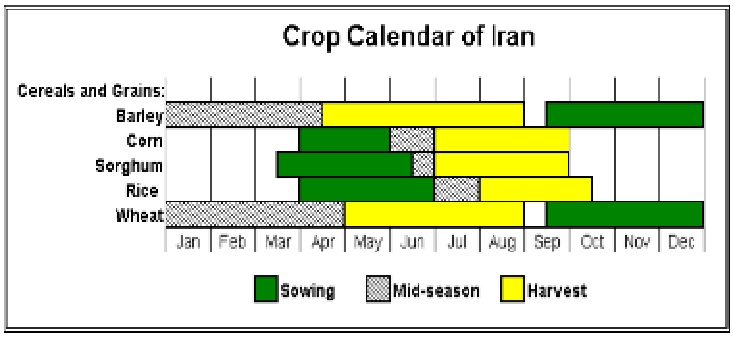
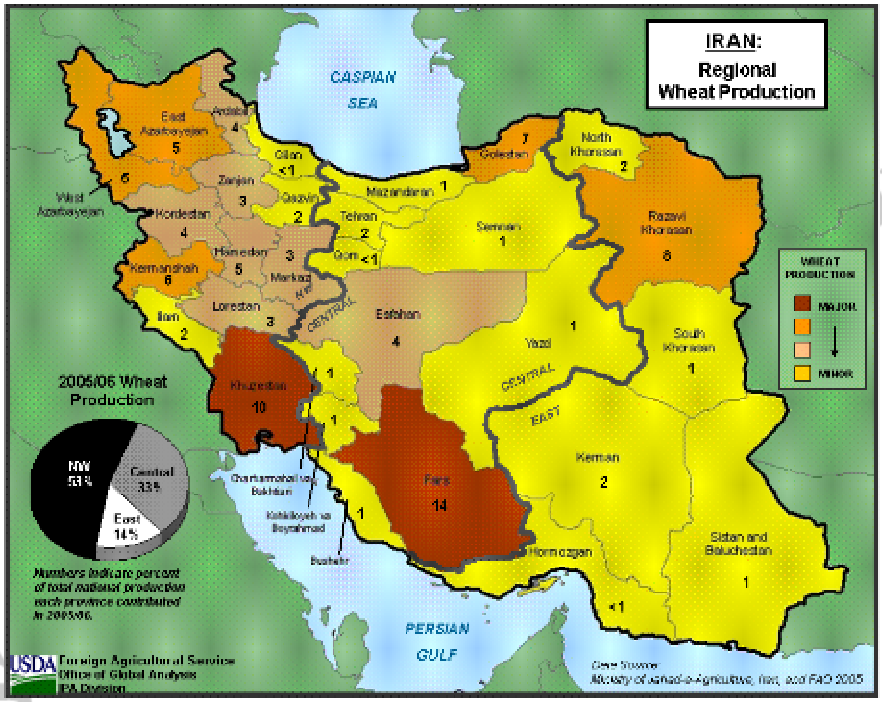
Appendix.





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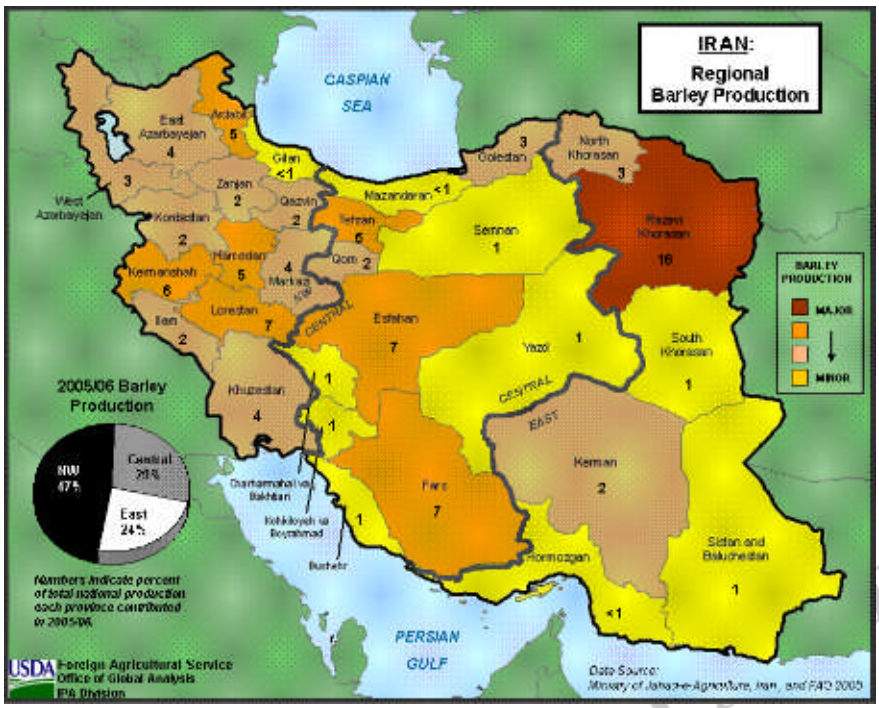

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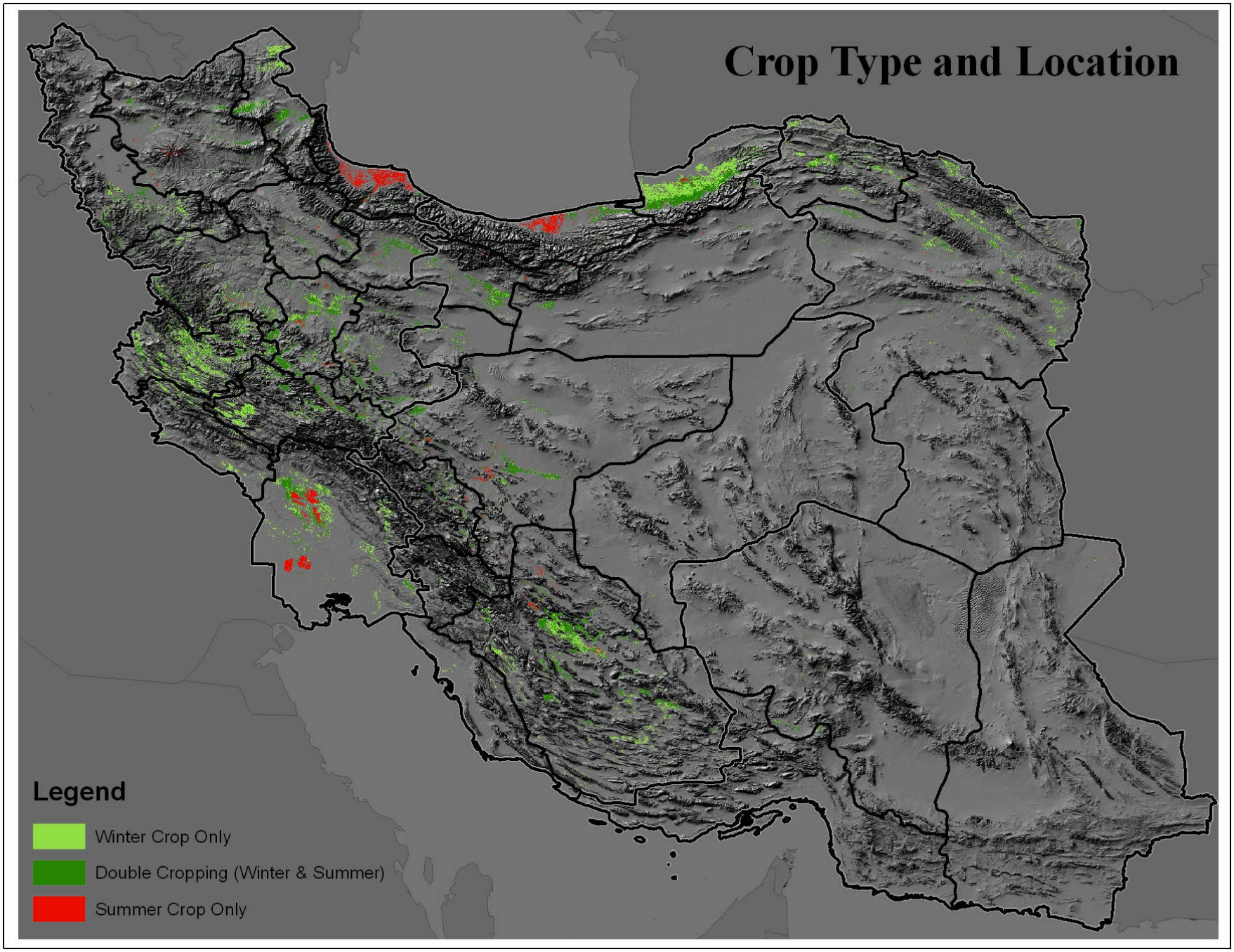

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